TMS Showcase

Washington DC

September 20, 2005

1. DEVELOPMENT OF TMS

1.1. Background

The tunnel management system (TMS) featured in the showcase was developed by Gannett Fleming under contract to the Federal Highway Administration and the Federal Transit Administration. District Department of Transportation (**d.**) served as a resource for prototype implementation.

1.2. Objectives:

- Conduct synthesis of tunnel inspection and maintenance / rehabilitation practices
    - Surveyed highway and rail transit tunnel owners via questionnaire for:
        - Maintenance and inspection practices
        - Records
        - Inventory
    - 40 out of 45 highway tunnel owners responded
    - 21 out of 26 transit tunnel owners responded
- Development preliminary inventory of high and rail transit tunnels (min length 100m, d. uses shorter number)
    - 353 tunnels

        - Broken down by age – 139 tunnels are between 51 and 100 years old, 31 are less than 10 years old.)
        - Also looked at distribution of tunnel length by age
    - Compared with bridges there are not many tunnels
    - Inventory
        - State, tunnel name, ID# etc
        - Method of construction, ground conditions
        - Tunnel shape, dimensions, clearances
        - Tunnel lining and support system
        - Type of ventilation system
- Develop manuals for inspection and rehabilitation
- Develop prototype database
    - Based on previous work
    - Four meetings to roll out the system
- Ensure compatibility with future management systems for assets

(Also used by the North Texas Turnpike Authority for one tunnel -1400 ft long)

Questions:

What defines a tunnel?

Needs to be defined.One other strategy is to define a tunnel as a structure that requires ventilation. 100 m is probably a good number.

Does it work for long tunnels?

Yes. You break the tunnel into "panels" and each panel is rated. At d. they are 50 ft in length.

2. KEY OBJECTIVES OF THE IMPLEMENTATION PROJECT IN D.C.

- Verify that the procedures for inspection and documentation are appropriate.
- Ensure element condition evaluation criteria in Inspection Manual are sufficiently described
- Adapt the prototype database to the client.
- Train the users.

3. TMS IMPLEMENTATION FOR D.

- Permitting and mobilization
- Inspections

Rating	Description
9	Newly completed construction
8	Excellent condition – no defects found
7	Good condition – No repairs necessary. Isolated defects found.
6	Shading between "5" and "7"
5	Fair condition – Minor repairs required but element is functioning as originally designed. Minor, moderate, and isolated severe defects are present with no significant section loss.
4	Shading between "3" and "5"
3	Poor condition - Major repairs are required and element is not functioning as design. Severe defects are present.
2	Serious condition – Major repairs are required immediately to keep structure open to highway or rail transit traffic.
1	Critical condition – Immediate closure required. Study should be performed to determine the feasibility of repairing the structure.

  - Structural (using a pen tablet)

        - Tunnel walls, ceilings, roof framing, columns, air plenums, vent shafts, auxiliary support spaces
    - Mechanical
        - Visual inspection of fans, sump pumps, CO monitoring system, deluge system.
    - Electrical
        - Light meter readings within each land in tunnels (every 10 ft)
        - Visual inspection of switchgear, panels, etc.
- Data entry

4. TMS INSTALLATION D.

- System Requirements
    - Windows 2000 or newer
    - 256 MB memory
    - 14 MB application
    - 40 MB Data Storage (complete inspection cycle of 17 tunnels)
    - Built in MS Access
- Customized for Log on System at d. – single point sign on.
- Converted database to SQL Server
- Added Hot Sync Feature

5. DEMO

Begins with a system map.

Mouse is used to access information for a particular tunnel.
Tunnel specific information uses a three-part screen:

- The top part of the screen is a key plan recording the panels and stations (method used for defining location). Color-coding represents condition – first trigger for d. is a 5; second trigger is 3. Mechanical and electrical features are also noted.

- The middle part of the screen provides the condition ratings for elements based on the panel identified in the top part of the screen. Tabs indicated structural and mechanical conditions. In the future this panel also records history. Icons provide access to other information:

    - Pencil – field sketch.

    - Camera – photos

    - Video camera – video – e.g. to capture sound to identify delaminated areas.

- The bottom part of the screen includes windows for:

    - Comments by year

    - Defect quantity by year (includes unit costs to give an estimated cost of repair).

    - Repair log

    - Emergency incidents.

- Buttons

    - Print (available on every screen) – on some screen you can choose which pieces to include.

    - Defect report – can select which tunnels and which years to create a defect report.

Comments/ questions:

Cross section provides important information. Not currently included in the system.

ITA does not require sketches. Uses a database.

Is there integration between CMS and TMS?

This area needs work. There is not a direct tie.

Does the system provide a prioritization?

In the course of the development of the system, it was felt that a prioritization was not needed.

How do you recognize the need for capital improvements?

This is a next step. Requires significant impact from owner.

6. DEMO – DEFINING THE SYSTEM

A "Wizard" has the ability to define the system and parameters. System map includes menus for

- Define system
    - Begin with a dumb graphic.
    - Add tunnels by defining the bounding polygon that represents the tunnel.
- System setup
- Tunnel definition
    - Define available elements by category (structural, mechanical, electrical, etc) and Element Name.
    - Define tunnel panels – based on an image, set panels
- Input options
    - Gather information.

7. TRAINING

One day training provided to AM staff at d.

8. CLIENT REQUESTED ADD-ONS

- Inspection of additional tunnels (unused tunnels)
- Detailed inspection of equipment (mechanical/ electrical) included in TMS
- Tracking maintenance (this is particularly important because d. uses maintenance contracts and does not keep records of maintenance activities.

9. MAINTENANCE MANAGEMENT SYSTEM

- Equipment / maintenance significant item
    - MSI #
    - Facility
    - Category
    - Name
    - General information
        - Manufacuturer
        - Model #, Location, Room, Deisgn #
        - System, subsystem
    - Components
    - Schedule and Procedures (links to procedures library)
    - Documents
    - Warranty
    - History

    - Maintenance Parts
    - Trends (looks at when a piece of equipment operating outside of a normal range. The user sets up queries.)
    - Run Time (monitoring for continuous operation)
- PM Procedures Library – processes, work etc.
- Work Orders
    - Planned maintenance (preventive maintenance) and demand maintenance (repairs)
    - Web generated work orders
    - Automated work orders (alarms for continuous monitoring of equipment)
    - Set up screen relates work orders to equipments and procedures. Also includes fields to include actual time spent, parts used etc.
    - System tracks
        - Work
        - Usage
        - Delinquent work orders
        - Queries
- Scheduling
    - PM
    - In-house staff
    - Identify manpower/staffing needs
    - By equipment, by given time period (e.g. a month)

- Inventory and Purchase Orders
- Decision making tool
    - Replace versus repair
    - Staffing issues
    - Order new parts

9.1. Use of Saber at d.

- Equipment
- Preventive maintenance = scheduled and input by contractore
- Work orders generated by contractor and /or d.
- Tracking work performance by contract and d.
- Decision making tool
- Saber used by SEPTA/ MBTA/ NY City Transit, Maryland MTA
- Demo available online – www.gfnet.com/saber

10.REFLECTIONS ON IMPLEMENTATION

- Accomplished objectives
- Successfully incorporation inspection manual procedures
- Adapted TMS to d.'s specific needs

11.WHAT'S IN THE FUTURE FOR THE TMS?

Dave Geiger, Director, Office of Asset Management.

- TMS does help agencies to link data and decision making.
- TMS came out of the workshops to look at the needs for TMS.

- Some specific enhancements – mechanical and electrical
- Other areas – decision making/ prioritization, inclusions of visuals and cross sections.
- Need to accommodate rapidly changing computing and software.
- System integration/ tradeoff analysis.
- AM is a strategic approach to managing transportation assets. Management systems are an integral part. TMS is a critical part.
- Inventory is critical. Helps to identify safety issues. This is an unanticipated benefit.
- What do the attendees suggest? Rajm…@fhwa.dot.gov is the FHWA point of contact.
- TMS needs flexibility so that the needs of owner agency can be met.

COMMENTS AND QUESTIONS:

How do you produce a summary report? Is there a format?

Perhaps is there a need for standardized from.

Performance based maintenance. How is it measured? How is implemented?

Requires information directly from the district.

TMS and MMS are different systems but integrated through a common portal. It is fairly straightforward to integrate the two.

Can MMS be used for other types of assets?

Yes.